

PATENT SPECIFICATION

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(54) ELECTRO-ACOUSTIC TRANSDUCERS

- (71) We, THE RANK ORGANISATION LIMITED, of 11 Hill Street, London, W1X 8AE, a British company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- This invention relates to electro-acoustic transducers, in particular electro-acoustic transducers of the dome type in which a dome shaped vibratory membrane is attached to the vibratory moving element of the electro-acoustic transducer and acts as a sound radiator.
- The vibrating membrane of a dome type loudspeaker has a central dome region surrounded by a raised annular bead which in combination with the dome region influences the acoustic characteristics of the loudspeaker. The loudspeaker will be mounted in a chassis structure and will have its own particular acoustic radiating characteristics including an amplitude-frequency curve and phase curve, which will in general be dependent upon the shading of certain zones of the loudspeaker membrane by the chassis structure.
- Various forms of shaded loudspeaker dome systems have been proposed in which the acoustic radiating characteristics of the loudspeaker result from special shading elements such as multiple funnel shaped screens for selectively shading the vibrating membrane.
- The object of the present invention is to provide a simple means of modifying the acoustic radiating characteristics of a loudspeaker of the dome type without requiring acoustic modification of an existing loudspeaker mounting system or chassis.
- Accordingly the present invention provides an electro-acoustic transducer having a dome shaped vibratory membrane formed with a central dome region surrounded by a raised annular bead, and a mounting plate attached to a peripheral region of the membrane surrounding the annular bead which, with the dome region, is located within an aperture in the mounting plate, and further including a planar disc-like element supported by the mounting plate, said element having a central non-circular aperture, smaller than the aperture in the mounting plate, within which at least part of the dome region of the membrane is located, such that the peripheral portions of the element overhang parts of the annular bead and the dome region to modify or shade the directional acoustic radiation characteristics of the transducer, a central unshaded portion of the membrane within the aperture of said element projecting through the plane of said element.
- The transducer according to the invention provides for shading of the membrane with extreme structural simplicity.
- By suitable selection of the shape of the aperture in the element it is possible to pre-determine the shading of the transducer. Moreover, the element may itself be easily replaceable, so that acoustic modification of an existing dome loudspeaker is facilitated.
- In a preferred embodiment of the invention, for example, as applied to a dome loudspeaker, the mounting plate has a substantially circular aperture, and the use of the disc-like element enables a desired shading of the loudspeaker to be achieved by a suitable choice of the shape of the aperture in the element. In a preferred practical embodiment of the invention the element has an elongate shape with symmetry about two mutually perpendicular axes.
- The membrane of the transducer is preferably attached to one face of the mounting plate while the disc-like element is attached to the opposite face of the mounting plate. The element may be made of metal, cardboard, paper or plastics material. The aperture in the element is preferably bounded by smooth edges. In a preferred embodiment the aperture in the element is bounded by a peripheral flange projecting towards the membrane.

The use of an element as herein described permits acoustic modification of existing dome loudspeaker systems and enables improved efficiency levels in desired frequency ranges to be achieved, with a very simple structure.

The invention will be further described, by way of example, with reference to the purely diagrammatic drawings accompanying the provisional specification, in which:

Figure 1 is a plan view of a dome loudspeaker according to one embodiment of the present invention;

Figure 2 is a cross-section taken on line II—II of Figure 1 and

Figure 3 is a plan view, on an enlarged scale, of the tuning element incorporated in the loudspeaker of Figures 1 and 2.

Figures 1 and 2 illustrate an electro-acoustic transducer comprising a dome type loudspeaker having a dome shaped vibratory membrane 1 formed with a central dome region 2, generally circular in plan, as shown in broken outline in Figure 2, surrounded by a raised annular bead 3. A rigid mounting plate 4 is attached to a peripheral region of the membrane 1 surrounding the annular bead 3, so that the dome region 2 and the bead 3 are located within a circular aperture 5 in the mounting plate 4. The mounting plate 4 forms part of a chassis of the loudspeaker. The membrane 1 is attached to a rear face of the mounting plate 4 so that the raised bead 3 and the dome region 2, which are convex towards the front of the loudspeaker, project forwardly through the aperture 5 in the mounting plate 4, towards the front of the mounting plate.

In order to modify the acoustic radiating characteristics of the dome loudspeaker the present invention provides a disc-like element 6 of metal or hard paper which is attached, for example by rivets 7, to the front face of the mounting plate 4, that is the face opposite that to which the membrane 1 is attached. The element 6 is formed with a central aperture 8 smaller than the aperture 5 in the mounting plate 4 so that peripheral portions of the element 6 overhang parts of the annular peripheral bead 3 and dome region 2 of the membrane 1, shading those parts acoustically. The shaded parts of the loudspeaker membrane will, of course, be determined by the shape of the aperture 8 in the element 6.

In the illustrated embodiment the central aperture 8 in the element 6 has a generally elongate shape with symmetry about two mutually perpendicular axes, so that the peripheral portions of the element 6 at opposite ends of the shorter axis of the aperture 8 effectively shade the underlying regions of the membrane 1. The edges of the

central aperture 8 in the element 6 at opposite ends of the longer axis of the aperture are formed with rounded recesses 9 (Figure 3), the edges of the aperture 8 converging towards the respective recesses 9 at an angle of 90°. These convergent edges of the aperture 8 adjoin respective circular arcs 10 having a radius which is five times that of the recesses 9, the diameter of the circular arcs 10 defining the smaller axis of the aperture 8. The element illustrated in Figure 3, having a major axis of symmetry defined by the respective recesses 9, has straight edge portions defining a part of each recess 9 and merging smoothly with the arcs 10, these edge portions converging at an angle of 30°.

In one practical embodiment of the invention the element 6 is made from hard paper or cardboard having a thickness of 0.35 — 0.4mm. When made from hard paper or cardboard the element 6 would in practice be subjected to a finishing operation to remove any fibres from the cut edges defining the aperture 8.

In another example the element 6 is fabricated in aluminium or some other turnable light metal and is formed with a continuous peripheral flange defining the aperture 8 and projecting inwardly towards the membrane 1. The element 6 may taper in thickness towards its peripheral flange: for example the outer face of the element 6 may be bevelled inwardly towards the aperture 8 at an angle of 8° with respect to the flat inner face which is in contact with the mounting plate 4.

WHAT WE CLAIM IS:—

1. An electro-acoustic transducer having a dome-shaped vibratory membrane formed with a central dome region surrounded by a raised annular bead, and a mounting plate attached to a peripheral region of the membrane surrounding the annular bead which, with the dome region, is located within an aperture in the mounting plate, and further including a planar disc-like element supported by the mounting plate, said element having a central non-circular aperture, smaller than the aperture in the mounting plate, within which at least part of the dome region of the membrane is located, such that the peripheral portions of the element overhang parts of the annular bead and the dome region to modify or shade the directional acoustic radiation characteristics of the transducer, a central unshaded portion of the membrane within the aperture of said element projecting through the plane of said element.

2. A transducer according to Claim 1, in which the aperture in the mounting plate is substantially circular while the aperture in the element has an elongate shape with

symmetry about two mutually perpendicular axes.

5 3. A transducer according to Claim 2, in which the elongate aperture in the element is formed with rounded recesses at opposite ends of the longer axis of the aperture, the edges of the aperture converging towards each said recess at an angle of substantially 90°.

10 4. A transducer according to any one of Claims 1 to 3, in which the membrane is attached to one face of the mounting plate and the planar disc-like element is attached to the opposite face of the mounting plate.

15 5. A transducer according to any one of the preceding claims, in which the element is made of metal, cardboard, paper or plastics material.

6. A transducer according to any one of

the preceding claims, in which the aperture in the element is bounded by smooth edges. 20

7. A transducer according to any one of the preceding claims, in which the aperture in the element is bounded by a peripheral flange projecting inwards towards the membrane. 25

8. A transducer according to Claim 7, in which the element has a bevelled outer face such that the element tapers in thickness towards the peripheral flange. 30

9. An electro-acoustic transducer substantially as herein described with reference to and as shown in the drawings accompanying the provisional specification.

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PROVISIONAL SPECIFICATION

1 SHEET

This drawing is a reproduction of
the Original on a reduced scale

Fig. 1.

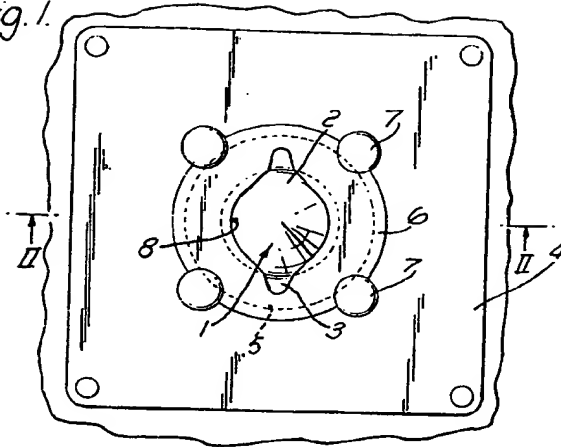


Fig. 2.

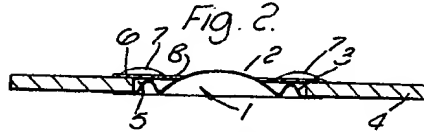


Fig. 3.

